United States Department of Agriculture
Forest Service
Southeastern Area

The Yazoo-Little Tallahatchie Flood Prevention Project:

Reforestation Procedures For Erosion Control

Forestry Report SA-FR 16

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USDA Forest Service
Southeastern Area
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Metric Conversions

1 inch = 2.54 cm
1 foot = 27.94 cm
1 acre = 0.4047 ha
Degrees Celcius = Fahrenheit - 32 times 0.5556

INTRODUCTION

During the decades that the Yazoo-Little Tallahatchie Flood Prevention Project (Y-LT) has been practicing reforestation in north Mississippi, many techniques and practices have been used experimentally. The project's primary mission has been flood prevention and erosion control. This handbook records those methods which have proved most effective and which were current at the time of its revision in 1981. This publication was previously entitled *The Y-LT Erosion Control Handbook* (August 1974).

The procedures covered here concern the geophysical requirements specifically in the watersheds of the Y-LT. They are the standard for reforestation and many of them apply to the future maintenance of good water and soil conditions.

This handbook further offers procedures for others with similar problems of reforestation for erosion control who may wish to benefit from the Y-LT experience.

CHAPTER 1.
PLANTING, TRANSPORTATION, AND STORAGE

PLANTING AREA DESIGNATION

Locating critical areas that require treatment and obtaining agreements from landowners are year-round jobs. When enough critical land has been so secured for one season's planting, finding areas for the following season should continue without a break. A seasonal approach will never suffice.

Boundary Designation

After each planting area is approved by the USDA Soil Conservation Service farm planner, it should be posted to an inventory control record. This record should show areas to be planted, and each day's planting accomplishments. The boundaries of these areas will be flagged and mapped by a qualified person as described in the following paragraphs. *Deviations from this procedure must be approved by the project manager.*

Mapping

Mapping should be kept current. Boundaries that are clearly defined on aerial photographs (fences, roads, distinct tree lines) offer no problems. Areas inside woods, of sheet erosion, shallow gullies, and the like require ground mapping using a plane table and compass or any method with comparable accuracy. Distances may be determined by pacing if accuracy within 3 percent of actual distances over varying terrain can be maintained.

1. On areas with well-defined boundaries (fences, etc.), the flagger will draw the boundary on an aerial photograph (8 inches to the mile - 1:7920) as he or she flags the boundary. Sufficient flagging tape should be used so that each point flagged can be seen from the previous point.

2. Small areas with boundaries poorly defined on the photograph may be mapped and flagged by a single person. Larger areas may require two operations; flagging and roughly outlining areas on an aerial photograph; then exact boundary mapping with plane table and compass, following the line previously flagged.

Those boundaries clearly visible on the photograph will have been drawn in at the time of flagging.

After an area is mapped,two overlays are prepared, one for office use and one for the planting foreman. Acreage and number of trees will be posted in the inventory control record.

Inspection

The PMO timber management specialist will inspect each field unit annually for proper mapping procedures, including field checks to confirm the validity of decisions to map poorly defined areas, and for accuracy.

FIELD PLANTING GUIDES

Planting Season.

Planting seasons normally begin in early December and end by early April in north Mississippi. When the weather is cool and wet, it is possible to plant after April 1, but hot, dry weather in late March and early April reduces seedling survival.

By mid-November, usually, frost has hardened off the seedlings, conditioning them for lifting at the contract nursery. It takes about 2 weeks after a hard freeze at the nursery for trees to be safely hardened off. Leave trees in nursery as long as possible to avoid early lifting and prolonged cold storage to await planting.

Circumstances such as labor shortages may occasionally demand an extended planting season. Planting may start as early as November 20 if seedlings can be lifted at

the nursery and soil moisture is adequate. But no planting should start until the soil is moist to the depth of 10 inches.

Suitable Field Planting Conditions

Once plantion is started, it should be a continuous operation; freezing, a prolonged dry period or inclement weather can, of course, interrupt the process. (Good judgement must be used; it may be better to wait for favorable conditions than to insist on getting a certain number of trees planted by a given time.)

Seedlings may be planted through a light snow cover if the ground is not frozen, or when the top ½ inch or less of the soil is frozen and the air temperature is above freezing.

Take care not to bruise the seedling stem when closing the slit in frozen soil. Suspend planting if the temperature is expected to remain below freezing most of the day. Under such conditions seedlings roots will freeze together in the planting bag and break easily when pulled apart for planting. If bundles become frozen, allow them to thaw naturally before planting; do not heat.

Species and Spacing

Loblolly pine has been established as the best tree species for reclaiming severely eroded land on the Y-LT. Compared to other southern pines, it grows faster, achieves quicker crown closure, and casts more litter at an earlier age.

The primary purpose of Y-LT tree planting is flood and erosion control; growing timber for wood products is secondary. Successful erosion control requires that trees are spaced to provide crown closure as soon as possible and to produce enough litter to stop soil movement in 5 to 10 years.

Control erosion in the most actively eroding (gully control) areas by planting about 1200 trees per acre using a 6 x 6 foot spacing *on the average.* On some of the more severe, near-sterile sites, closer spacing is usually necessary to obtain a protective cover as soon as possible. Because of these factors seedlings may be planted at a 5 x 5 foot spacing on these sites. Closer spacing must be approved by the project manager.

Do not rigidly follow this spacing, but take advantage of natural or prepared planting sites which are more favorable.

In less severe Critical Area Stabilization areas, spacing should be 7 x 8 feet, or about 780 trees per acre. (For normal planting sites with no visible erosion the recommended silvicultural spacing is 8 x 8 feet.)

Avoid underplanting established clumps of pine, desirable hardwoods, or den trees. Place seedlings so that crowns of pine or other desirable trees will not supress seedlings as they develop.

Hand Planting

Each tree planter will be trained to perform the following steps (see figure 1) when planting a seedling:

1. Using boot heel or a planting bar blade, clear a 4 to 6 inch strip of all grass, leaves, or trash.

2. Using both hands and one foot, with the bar inclined slightly toward the body so that the far side of the blade is vertical, sink the blade to its full length into the soil to make a planting slit at least 4 inches beyond the near edge of the cleared strip.

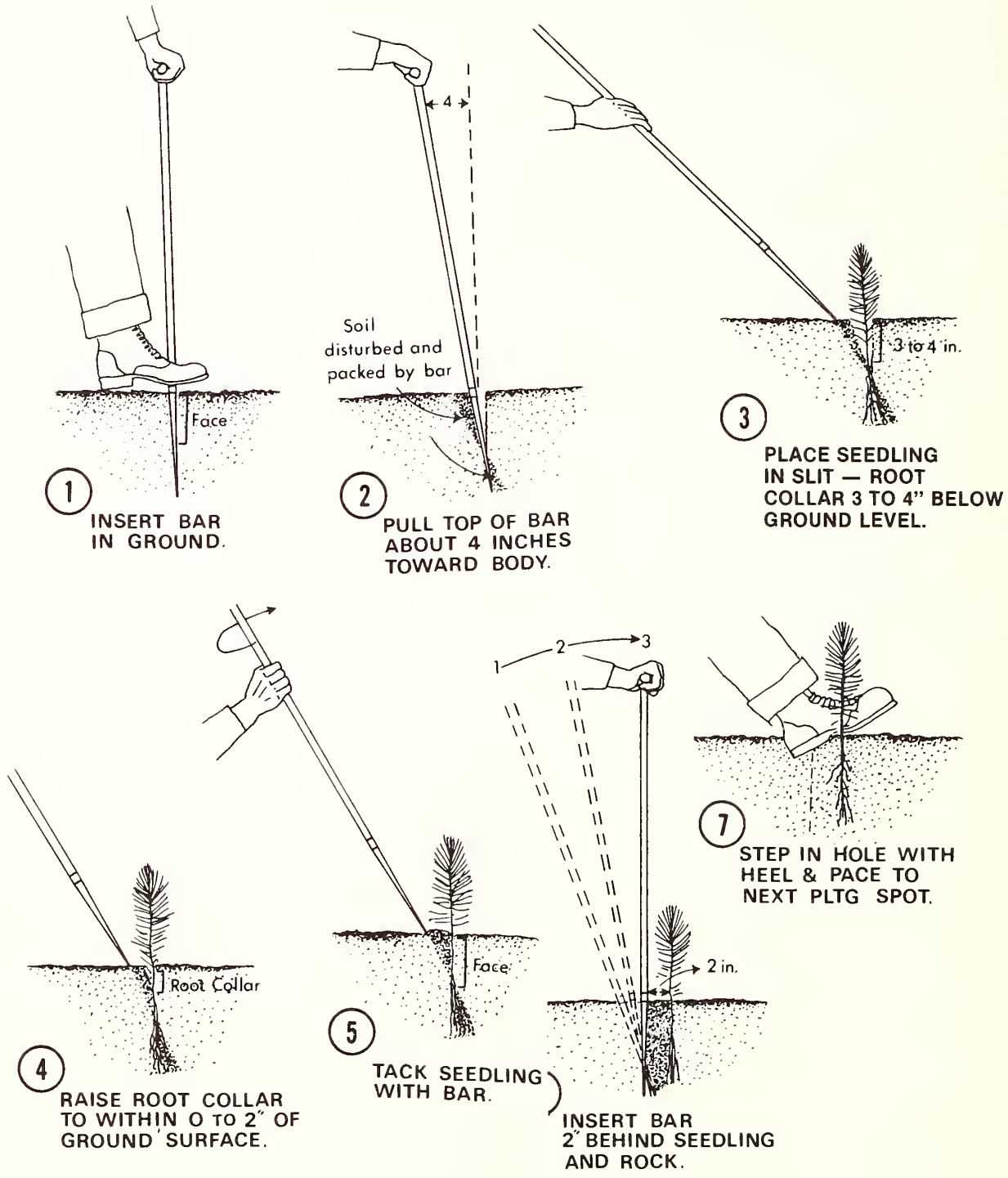
3. Pull the handle of the bar about 4 inches toward body to open the top of the planting slit a maximum of 1½ inches. Do not push the bar from body; this will disturb the face of the planting slit, which should remain vertical to keep the seedling upright and to ensure maximum movement of water through the soil to the roots.

4. Pull the bar from the slit and rest the blade 1 inch behind the rear edge of the planting slit, supporting the bar with one hand.

5. Take one seedling from planting bag and insert the roots into the slit so that the root collar is 3 to 4 inches below the ground surface.

6. Shake the seedling to enable the roots

Figure 1.-- Y-LT Planting Technique



to stand in a natural position, and raise the root collar to within 0 to 2 inches of the ground surface. This action will straighten the lateral roots and prevent U-rooting of the tap root. (The root collar represents the depth the seedling grew in the nursery.)

7. While holding the seedling upright in this position, twist the bar blade so that soil forced into the top of the slit will hold the seedling in place.

8. Release the seedling and set the bar 2 inches from the seedling stem in a vertical position and insert the full length of the blade to make a closing slit. Push forward and pull back once to tighten the tree.

9. Insert the bar about 1 inch behind closing, about 1 inch deep, and twist it to close the closing slit. Firmly press soil into the top of the closing slit with the heel of boot without stepping on seedling. NOTE: The planting bar blade is 10 inches long. When the edges of the blade become rounded and the length is worn to less than 9 inches, replace the bar.

Using this planting method, one person should plant 150 to 200 trees per hour, depending on planting conditions.

Quality Control Checks

The planting crew foreman will inspect the following items:

1. *Planting Slit* — (a) correct depth, (b) removal of debris such as trash and leaves, (c) top and bottom properly closed.
2. *Planting Quality* — (a) trees vertical, (b) U-roots, (c) loose seedlings, (d) root collar more than 2 inches below the surface, (e) root collar above the surface, (f) more than one seedling in a slit, (g) correct spacing, (h) cull seedlings.
3. *Care of Planting Stock* — (a) ample wet moss in the bag to keep the roots moist, (b) planter holds only one tree in hand at a time.

Gully Planting Site Selection

Because of the severity of conditions, planting sites should be selected one at a time. Instead of following rigid spacing guidelines, the planter should select naturally advantageous spots and man-made improved sites. The best soil and moisture available are critical for pine establishment and growth.

Normally, seedlings should not be planted on narrow hogbacks without top soil, on steep side slopes, or in intermittant water courses without sediment-collecting barriers.

Quality of Planting Stock

From each shipment of 1-0 loblolly pine planting stock, one bale will be sampled and graded using Wakeley's specifications for 1-, 2-, and 3-grade seedlings (see table 1). Record the following: nursery name, bundle weight, bundle condition (loose, tight), type and adequacy of packing medium, roots dry or moist, length of roots in inches, number of trees in bale, evidence of heat, evidence of rough handling, evidence of insects or

Table 1. — Specifications of grades of uninjured 1-year-old loblolly pine seedlings

Grade	Stem lengths	Thickness of stem at ground	Nature of stem	Bark of stem	Needles	Winter buds
	(Inches)	*(Inches)*				
1	5 to 12	3/16 or larger	Stiff; woody	Usually on entire stem	Almost entirely in 3's	Usually present
2	4 to 7, sometimes 10	At least 1/8	Moderately stiff	On lower part at least, often all over	Part at least in 3's	Ocassionally present
3	Usually less than 5	Less than 1/8	Weak; often juicy	Often lacking	Practically all single; usually bluish	Almost never present

Source: Wakeley, P.C. *Planting the Southern Pines,* USDA, Monog. 18, p. 103 (1954).

disease, date seedlings packed, date seedlings received, and number of seedlings by grade.

Spot check bales upon receipt for excessive heating or drying, particularly bales toward the interior of the shipment. Stock that is dry or has received excessive heat should be set aside for later determination of suitability.

Plant all seedlings except culls. A cull is a seedling damaged by disease or insects, has injured stems or roots, or has a tap root less than 4 inches long. If, however, a seedling meets all other specifications for grade 2, it may be planted with a 4-inch tap root.

Each planter must be taught to recognize culls.

Root Pruning

Seedling roots are usually pruned to the correct planting length at the nursery. Seedlings with excessively long roots received in the field should be carefully trimmed before planting. This must be done by the crew foreman or someone designated and trained by him. Prune tap roots to 7 or 8 inches below the collar. Do not prune laterals. Care must be taken to prevent roots from drying out during the pruning operation.

Use a sharp instrument and cut cleanly; severe damage will result from jerking or tearing the root system.

SEEDLING TRANSPORTATION, STORAGE, AND PROTECTION

Survival success or failure depends on the care of seedlings at all points between being lifted at the nursery and being planted. Constant vigilance is required to prevent injury from exposure to sun and wind, freezing, mistreatment, and heating or drying during shipment or storage. On the Y-LT, physiologically strong seedlings are particularly necessary because adverse planting sites predominate in this fragile soil.

Transportation

Drying and heating are the two principal causes of injury in transit. If possible, load seedlings at the nursery and unload them at their destination during the same day. They should not be transported when the air temperature is 60 °F or higher.

Use of spacers between layers of bundles has been suggested, but Y-LT experience has not shown this practice to be necessary. Also, covering seedlings on open-bed trucks with a tarpaulin has proved more harmful than helpful; it causes overheating.

Refrigerated Storage

Use a cold storage unit to the maximum extent. Pine seedlings can be held in cold storage for 2 to 3 weeks without apparent damage, but after 3 weeks they become progressively weaker until, from 10 to 12 weeks, survival will be down to 10 percent or less.

The relative humidity should be above 90 percent. Check the seedlings for dryness at least three times a week. Seedlings lifted after dormancy will probably require watering (discussed later). Although dormant seedlings normally do not require periodic watering, this assumption must not be taken for granted.

Planning should ensure that seedlings are stored for the shortest possible time before planting, leaving them in cold storage for maximum protection. Seedlings held in cold storage longest will be removed and planted first — unless others have been physiologically weakened by adverse conditions.

In the past, refrigerated railroad cars have been used to store seedlings, but this practice is discouraged because of the difficulty in maintaining first-in-first-out removal, and in the lack of block ice service.

Storage In Protected Sheds

The most common method for temporary seedling storage on the Y-LT is in protected sheds where seedlings can remain for 2 to 3 weeks without harm. Heat should be

available to avoid freezing.

Bales should be stored in slanted, tiered racks where the slant provides drainage of excess water. A drain or trough may be needed to handle water runoff.

Bales should never be stacked on top of each other. (See figure 2.)

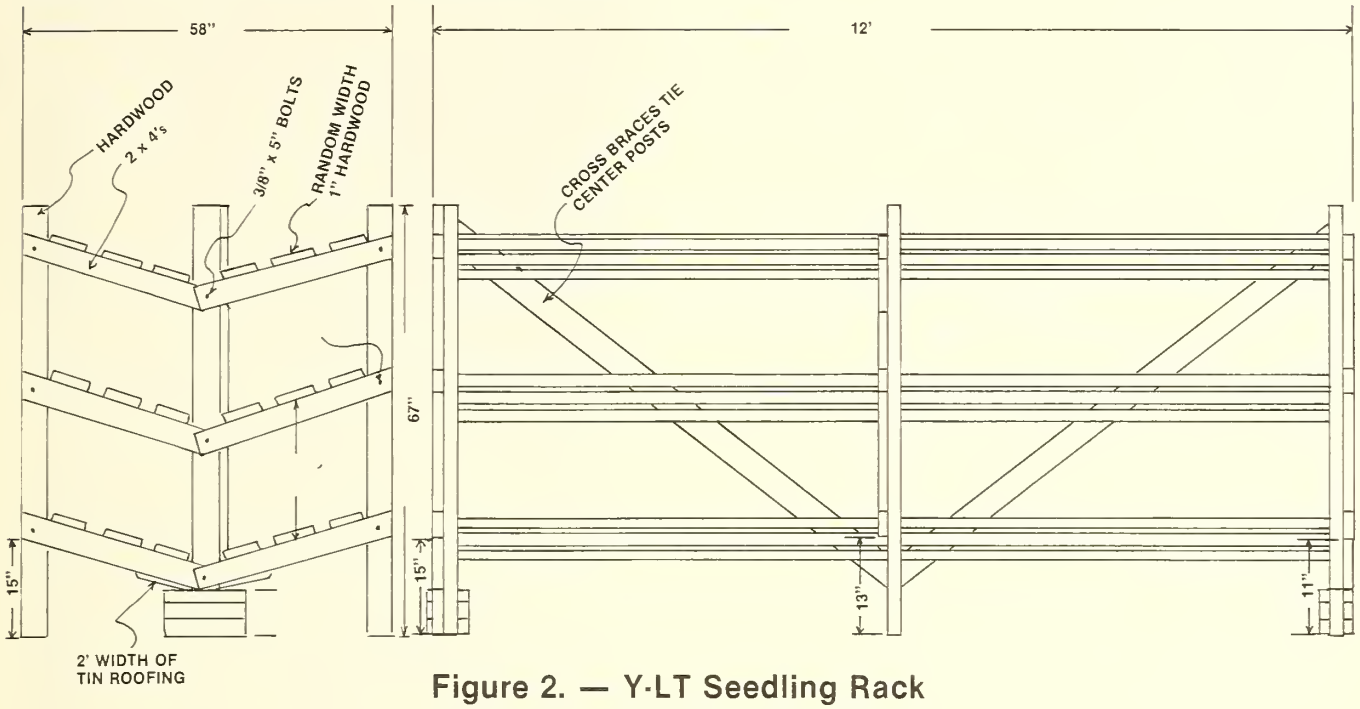


Figure 2. — Y-LT Seedling Rack

Watering Seedlings

Upon arrival from the nursery, seedlings may need watering, and they should be checked at least 3 times a week for proper moisture. Roots and packing medium should be damp at all times. Remember that seedlings lifted after breaking dormancy will dry out much faster than dormant seedlings.

The best watering device is a perforated metal tube with a cutoff valve (see figure 3).

The proper watering procedure is:

1. Insert tube into the end of a bale and turn on the water. Do this in three or four places so the entire area is covered.
2. Roll the bale 180 degrees and repeat.

Protection from Freezing

Both the literature and Y-LT experience offer contradictory information on the length of time that seedlings can remain frozen and still survive when planted. It seems certain, however, that freezing harms them and that after 48 hours, survival is unlikely.

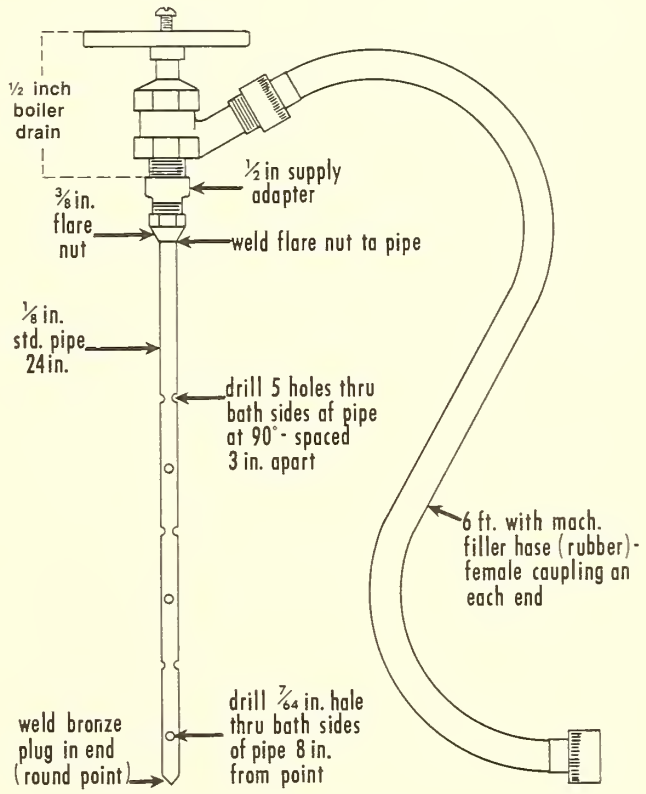


Figure 3. — Y-LT watering nozzle

If seedlings do become frozen, they must be thawed slowly *without* applying heat. Great care must be taken then in separating the roots from the bundle. The slightest injury will lessen even more the chance of survival.

Because freezing can only lessen the chances of survival, make every effort not to let them freeze.

Protection in the Field

Crew foremen must watch constantly to insure that seedlings are not exposed to adverse conditions after they leave the storage shed. Bales removed and not used must be noted when they are returned to the shed so that they will be loaded last on the trucks the following morning — then planted first.

Trucks should not be parked in the sun on warm days. If they must be parked in the sun, put the trees in the shade of the truck or under it. Do *not* cover them in the truck; this makes them hotter. Bales that are partly used will be re-wrapped and packing medium spread over the roots to prevent drying.

Large, open areas should be planted in December and January to avoid hot, windy weather.

Other precautions:

- Don't overfill planting bags — roots can be damaged. Also, the last trees in the bag may dry out. Depending on the weather, wind and other factors, put only the number of seedlings in a bag as can remain moist. Experience must be the guide.
- Plant seedlings first that have been in the bag the longest, and so on.
- Avoid exposure of the roots, particularly in dry, windy weather. Even a full minute may be too long.
- Use care when separating seedlings from bale. Tightly packed lateral roots become entwined and are easily broken.
- Keep wet sphagnum moss in the bag to prevent drying of the roots.

FUNDING

In its reforestation work to heal and prevent erosion, the Y-LT operates under a memorandum of understanding with the Soil Conservation Service. Funding is established through a determination by the SCS of the severity of land damage.

Gully Control with 100 Percent Funding. — Gully control (GC) planting protects severely eroding lands which produce or are likely to produce severe offsite damage, usually on lands in capability classes VI and VII. Usually, 100 percent of the cost of establishing vegetation on these critical areas is Federally funded. Such land must be open, with less than 10 percent forest cover.

Critical Area Stabilization (CAS). — Planting of seedlings may be done with less than 100 percent cost-share payments. CAS planting, often called 80-20, treats areas which are less critical than those covered by the GC-100 percent program, but which still contribute substantially to offsite damage through erosion and high runoff. Treatment may be cost-shared, with the cooperator paying a minimum of 20 percent; the Federal government, a maximum of 80 percent.

Non-assistance Trees. — Seedlings can be furnished for landowners themselves to plant on critical areas if the land qualifies under one of the higher cost-share rates (100 or 80-20 percent). This practice may be followed when personnel shortages, funding, or other limitations prevent planting by the agency. Some seedlings may be given to local landowners and homeowners for planting on house lots and other areas to control erosion. The total number of such seedlings should not exceed 3 percent of the unit's annual planting program.

HANDLING COST-SHARE COLLECTIONS

Landowners participating in the 80-20 program must pay a minimum of 20 percent

of the planting costs for establishing a stand of trees on critical areas. With one exception, payment must be in advance. The exception is in-kind contributions, i.e., when the landowners contribute their own services instead of money.

The project forester is the collection officer on each unit, and sends collections to the PMO collection officer *on the same day* they are received. If they must be held overnight, they must be kept in a locked file or drawer. Personal checks may be accepted, but payment is preferred in cashier's or certified checks, postal or bank money orders. Payee is *Forest Service, USDA*. Cash will not be accepted.

Upon receipt of payment at the PMO, Form 6500-89, *Bill for Collection*, will be prepared. The pink copy (payer's receipt) and the yellow copy will be returned to the project forester who will give the payer's copy to the landowner and put the yellow copy in the collection officer's file. Only after the project forester receives these copies can the Forest Service begin the work covered by that payment.

INSPECTIONS

Force Account Planting

This planting is accomplished by project crews. Project foresters, forestry technicians, crew foremen, and the PMO timber management specialist will periodically inspect each crew to evaluate planting quality, identify errors, and take corrective action to meet planting standards.

Inspection schedules:

Crew foreman — Daily
Forestry technician — Twice weekly
Project forester — Weekly
Timber management specialist (PMO) — Monthly

Early in the season more frequent inspections by the project forester and forestry technician will be necessary until quality and quantity are achieved by the crew. All deficiencies are to be corrected immediately.

All inspection reports will be filed in a folder set up specifically for that purpose under file designation 2470. After the planting season, these reports will be filed with the seedling receipt and overlay map in the farm folder.

Crew Foreman

The foreman will check each planter regularly for planting techniques and seedling grade, culling, and root condition. During the day the foreman will dig at least three seedlings planted by each planter at varying times of the day; planting quality can suffer because of fatigue, weather, terrain and other factors. Spacing will be checked on ten 1/100-acre plots.

Project Forester and Forestry Technician

The project forester's weekly inspection will cover the same items as the technician's, described below.

The technician will inspect the same items as the foreman on ten 1/100-acre plots randomly spaced over the planting area, digging one seedling per plot. This seedling should be the one closest to the plot center.

The technician will also check crew organization. There will be a lead worker to set the pace, and each crew member should be lined up one space from and one space back of the person being followed. (A space, of course, will be the designated planting space, 6 x 6, 7 x 8, etc.) The crew should progress without any noticeable break in the line.

Safety will be a part of all inspections. The technician will check the crew vehicle, equipment, field clothing, and hazards peculiar to the area and the weather.

Deficiencies will be discussed in the field with the crew foreman, and the technician will help the foreman find solutions and apply corrective action. The technician will file a report with the project forester and give a briefing on the field situation.

PMO Timber Management Specialist

This check will be the same type as those of the project forester and technician and they will accompany the TMS during an inspection.

On the Y-LT, the terms "hot" and "cold" checks have been used to describe inspections. A hot check is one conducted while work is in progress. A cold check is carried out on work performed the previous day or earlier. The TMS will make both hot and cold checks at random times and will visually inspect each crew working during a visit.

Particular care should be taken in checking spacing. Spacing should be correct for the particular terrain and soil being planted, i.e., closer spacing for gullied or critically eroded areas.

Minimum planting standards require 90 percent of seedlings to be correctly planted. An individual crew member who consistently fails to meet quality and production standards will be released.

Within 5 days of the field check, the unit will be furnished a report of the inspection. Records and reports are described in the appendix.

STOCKING EXAMINATIONS

General Requirements

Stocking examinations should be conducted after the first growing season is completed, i.e., summer or fall following planting. In October or November, after the first frost, the young trees are easier to see. The inspection should be completed by early December to allow time to schedule replanting during the planting season in progress.

For each county and planting type (100 or 80-20 percent, other) the following data will be shown: acres planted, acres checked, areas lost, percent of checked acres lost, and reasons for loss. Show grand totals for the unit. Use the daily inventory sheet to analyze the causes for poor survival.

Examinations, including replanting, will be grouped into two catagories:

(1) All force account, GC and CAS
(2) Non-Assistance, 10 acres or more

Field Procedures

Field examination will be conducted in quadrats as follows:

1. Less than 10 acres — a minimum of 10 quadrats.
2. 10 to 100 acres — one quadrat per acre.
3. More than 100 acres — 100 quadrats.

Quadrats will correspond to seedling spacing, i.e., where seedling spacing is 7 x 8 feet, quadrats will be 7 x 8 feet.

Before going to the field, draw lines of travel on a plantation map showing the number of plots to take on each line and the distance between them. In the field, cover the areas systematically, using a hand compass and pacing distances.

A quadrat is stocked if it contains one or more living planted or natural desirable seedlings.

On form FP-53 use a check mark (✓) in all columns except the ones headed "Planted" and "Natural." In these two columns, dot-tally actual trees counted.

The minimum acceptable stocking count per acre is 400 trees for 7 x 8 foot spacing, and 600 trees for 6 x 6 foot spacing. Calculate adequate stocking as follows:

Spacing	Round No. Seedlings/Ac.	Quads Stocked	Number of Seedlings/Ac.
feet		*percent*	
6 x 6	1,200	50	600 (adequate)
7 x 8	800	25	200 (inadequate)

Some areas within a plantation may be found to be inadequately stocked. These should be flagged and mapped. Although, for reporting purposes, a plantation is considered adequately stocked when 50 percent or more quads are stocked, there may be sections which do require replanting. Conversely, the entire plantation may show inadequate survival although segments of it do

not require replanting. Such situations should be noted.

TRAINING

Project-wide Reforestation Workshop. — This session covers such subjects as planting techniques, care of seedlings, inspection systems, safety, records, and the scope of the entire program. This workshop should be given each year in November before the start of planting season. Even experienced workers need a refresher course.

Pre-planting Training. — Sessions to train crew members in planting techniques, care of seedlings, crew organization, and safety.

Selection of Gully Planting Sites. — Project forester and technician will conduct this training periodically for foremen and crew members.

Training of New Crew Members. — Before placing new employees in the line, the crew foreman will give them 2 hours of field training by demonstration and by observation of experienced crew members. Recognition of safety hazards and how to avoid them will be emphasized.

Root-Pruner Training. — Either a crew foreman or a crew member may be designated a root pruner. Training will be conducted annually. Ability to properly prune roots will be checked on periodic inspections. Root pruning should not be done unless authorized by the project forester.

Pacing. — Individuals who perform flagging and mapping duties must refresh their skills on a designated pacing course as needed to maintain accuracy.

CHAPTER 2.
SITE IMPROVEMENT MEASURES

GENERAL REQUIREMENTS

On severely eroded land, site improvement measures are often needed for satisfactory seedling survival. Small sediment check dams and temporary vegetation such as grasses are the usual measures.

Erosion control blankets spread over planted grass seed are sometimes used to reduce immediate on-site soil movement and to help establish grass until pine needles create a forest floor.

Planning is essential. Soil conditions and slope must be evaluated in the field, on the spot. Sandy soil, for instance, will require better keying-in of supports than clay, and more dams may be needed on one part of the slope than on another.

SEDIMENT CHECK DAMS

By trapping sediment these dams reduce the steepness of the gradient of eroding channels. The sediment and trapped moisture further promote pine seedling survival and growth.

Sediment check dams should be located in the small drainages of the upper reaches of the gully. Any spot is satisfactory that will collect enough sediment to provide a good planting site. The idea is that seedlings will be planted in the trapped sediment behind the dam during the following planting season.

Dams should not be placed across the main drainage course of a large gully because they will simply wash out. The most effective dams are those that will collect enough sediment to support two seedlings, one on each side. Dams should be 4 to 8 feet across and constructed in a series down the gully. Depending on the severity of the gully, dams may be spaced as little as 5 feet or as much as 10 feet apart.

Wide gullies usually require sediment fences. There are, however, gullies that are so extreme that a heavy storm will produce a volume and pressure of water to blow out even a sediment fence. Unusually heavy storms will sometimes blow out the best sediment dams, and there will be nothing to do but start again. Several kinds of sediment check dams have proved successful on the Y-LT, principally those made of brush, fabric, or hay bales.

Brush Dams

Brush dams, preferably of cedar, trap sediment and moisture while allowing excess sand, silt, and water to filter through. They are built of brush and small poles collected near the site. Establish them as follows:

1. Determine proper location
2. Place a small pole across the gully about 12 to 18 inches above the bottom of the gully. Notch the walls in the gully to receive the ends of the pole to prevent it from washing out.
3. Place brush, with butt-ends downstream, across the watercourse so that branches loosely overlap and are on the upstream side of the pole. Stack the sides higher than the middle so stream overflow will pass over the middle of the dam instead of around the ends, washing the dam out.
4. Place a second pole on top of the brush to hold it in place.
5. Tie the poles and brush together using small cedar limbs.
6. Throw dirt on ends of the brush to help hold it in place.

Fabric Dams

A fabric dam is made from a rot-resistant, water-permeable fabric draped over a framework of brush or hogwire mesh. Establish a fabric dam as follows:

1. Determine location.

2. Place a small pole across a gully, about 12 to 18 inches above the bottom of the gully. Notch the gully banks to receive the pole ends so the pole will not wash out.
3. Build a framework of brush, or brush in conjunction with hogwire mesh.
4. Drape fabric over the framework and along the gully bottom and walls to prevent undercutting; how far must be an onsite decision.
5. Tack the edges of the fabric to the frame with fence staples and to the ground with 6-inch soil staples.
6. Cover the upstream edge of the fabric with soil to prevent underwashing.

Hay Bale Dams

The hay bale dam is a semi-impervious barrier, denser than a brush dam, but less durable than a brush or fabric dam. Establish a hay bale dam as follows:

1. Determine proper location.
2. Notch both the bottom and the walls of a gully to key in the bale and prevent the dam from washing out.
3. On the downstream side, drive two or three survey stakes into the ground against the bale for additional support.

Sediment Fence

The sediment-trapping fence of posts, hogwire, and rot-resistant, water-permeable fabric is usually built where a gully is 8 to 10 feet wide or wider (see figure 4). Do not over-build; a maximum height is about 24 inches. Establish a sediment fence as follows:

1. Determine proper location.
2. Erect posts across a gully, about 1½ feet deep and 4 feet apart.
3. Design the height of the fence to be level with the upstream end of sediment trapping area.
4. Extend the sides, or wings, of the fence into the gully walls for maximum sediment-trapping capability and to prevent the storm flow from washing around the sides. These wings should be at least as long as the fence is high, often longer. An onsite decision is required.
5. Staple hogwire mesh to the upstream side of the posts.
6. Install fabric against the upstream side of the mesh, as follows:
   A. Bury the lower edges 6 to 8 inches.
   B. Overlap 6 inches over the top of the mesh.
   C. Fasten to posts with fence staples.
   D. Tie fabric to the mesh to prevent wind tear.

EROSION CONTROL BLANKETS

These devices stabilize the soil and help establish grass seed. They are economical because, spread over planted grass seed, they immediately reduce soil movement and promote grass so that dam frequency can be reduced. Also, replanting of pine seedlings is less often required. Three kinds of erosion control blankets have been used successfully on the Y-LT:

1. Excelsior Blanket. This is a manufactured mat of curled-wood shavings held in a 1 x 2-inch mesh of biodegradable, extruded plastic.
2. Mulch Fabric. This blanket is made of paper strips .4 inches wide, interwoven with knitted, synthetic netting.
3. Plastic Netting. This ½ x ¾-inch mesh, plastic netting is designed to be spread and stapled over hay or straw mulch scattered over a seeded area.

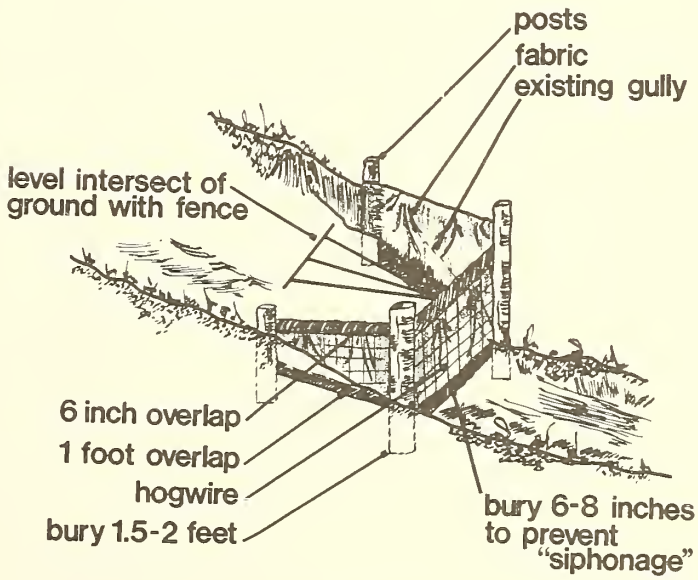


Figure 4 — Y-LT Sediment Fence

Installation

Blankets should be installed on high priority sites where, without them, grass cover has little chance of being established. Examples are hogbacks and upper slopes of gullies where rain would readily wash grass seeds and fertilizer down the slope before grass could get established.

After the site has been scarified, fertilized, and seeded:

1. Unroll a blanket to fit loosely over the terrain.
2. Spread the blanket to fit snugly to irregular ground, but not pulled taut. Using a wood or plastic mallet, tack the blanket to the ground with 6-inch soil staples. Place the staples around the edges at 9-inch intervals, and across the blanket at 4-foot intervals.

Temporary Vegetation

The most practical method for achieving rapid protective cover on critical sites is to plant fast growing vegetation, such as grasses, along with the pines. The grasses selected must be compatable with pines, i.e., do not compete excessively for soil moisture.

Grasses most frequently used in site improvement are African weeping, love, common Bermuda, rye and fescue. Generally, lovegrass is preferred because it flourishes on dry sites and can withstand deep and continued siltation.

Grass	Seeding rate	Seeding date	Planting depth	Minimum fertilizer[1] needed
	lb/acre		*inches*	
African weeping, and lovegrass	10	Mar-June	½	78-78-78
Common Bermuda	5	Mar-June	¼	78-78-78
Rye	60	Sept-Nov	1½	78-78-78
Fescue	30	Sept-Nov	½-1	78-78-78

[1]Fertilizer rates are pounds of actual nitrogen, super phosphate and potassium to equal 600 pounds of available nutrients per acre.

Seedling preparation can be done by loosening the soil with fire rakes or similar tools. After spreading fertilizer sow the seed with a cyclone seeder or a shaker made from a fruit jar. Lovegrass seed is small and needs little or no raking.

Grass seed can be sown in strips on the flatter, lower reaches of the gully where it is not practical to build sediment check dams. These grassy strips will catch sediment and provide satisfactory planting sites.

Erosion control blankets should be used to protect grass seed on critical hogbacks and gully slopes.

SITE IMPROVEMENT MEASURES BY PRIORITY

When planning site improvement measures, priorities must be set for treatment. Situations below are roughly rank-ordered within the two major priority groups, the most severe listed first.

Priority I

1. Direct siltation of domestic water supply: lake, reservoir, or farm pond.
2. Direct siltation of agricultural land.
3. Gully is headcutting into roads, farm improvements, or pastures.
4. Silt deposition directly into major river channel.
5. Silt deposition directly into major perennial stream course.
6. Sheet erosion causing gullying of lower slopes, with deposition into perennial or major river channel.

Priority II

1. Pastures are in danger if present erosion rate continues for 2 to 3 years.
2. Area is actively eroding (sheet and gully), but deposition is primarily into ephemeral channels, and only during flooding will silt reach perennial stream course.
3. Pastures are in danger if present erosion rate continues for 5 to 7 years.
4. Area is an eyesore, but silt deposition is not reaching a major channel.
5. Active sheet erosion, but little offsite damage.

CHAPTER 3.
SITE PROTECTION MEASURES

FENCING SEDIMENT SOURCE AREAS

To protect reforestation designed for flood control, the Y-LT will fence areas at no cost to the landowner. This work must be approved in the SCS farm plan before fencing is started. To qualify, the SCS must determine that the area is so intensively grazed that trees and other vegetation planted would be severely damaged without the protection of fencing.

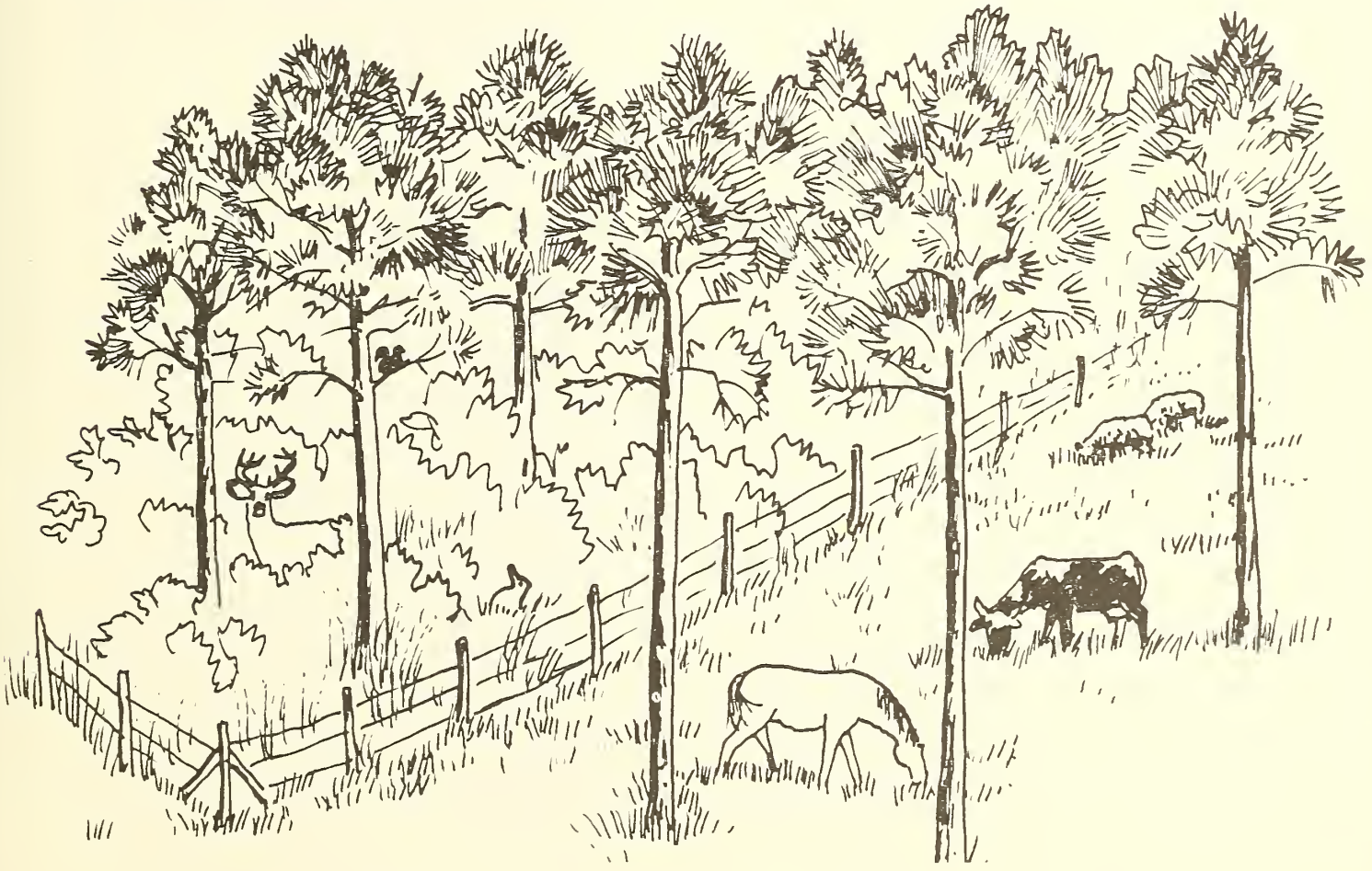
Fence Construction

First, reach a mutual agreement with the landowner on the location of the fence. Do this on the ground. Usually, the fence will follow the boundary of the eroded area far enough from gully rims to allow stabilization before erosion reaches the fence line.

Posts can be either untreated, durable hardwoods or treated pine, whichever is cheaper. Cypress, locust, white and post oak, cedar, and catalpa are preferred for untreated posts; they have sufficient lifespans to protect planted trees until the trees are large enough to escape grazing and trampling damage. Five to 6 years is required.

Posts should be set 18 inches deep and not more than 20 feet apart. Barbed wire will be 12½ gauge galvanized, and 3 strands will be installed.

The fence should have no gaps or gates. Vegetation suitable for wildlife should be planted at selected spots along the perimeter of the area inside the fence.



CHAPTER 4.
HYDROLOGIC STAND IMPROVEMENT

Hydrologic stand improvement (HSI) is the removal of hardwoods which compete with seedlings planted for erosion control and flood prevention. See the appendix for reports and records related to this chapter.

SEEDLING RELEASE

General Requirements

All cull hardwood trees (except as noted under wildlife coordination) overtopping or which will overtop planted pine seedlings will be treated with herbicides. Generally, treat stems head-high and taller. Smaller, supressed stems growing where they will not intercept sunlight will not adversely affect loblolly survival. All release work should be completed the same fiscal year the seedlings are planted. No release work will be done in advance because deadening mature hardwoods releases hardwood saplings which might then overtop planted pines.

Stem Treatment With Injectors

Injector. — Metered injectors with a 3 inch bit have proved most effective for release work on the Y-LT.

Herbicides. — This area is one of changing technology and foresters should stay current on the best EPA-approved herbicide. Several herbicides may be used: 2,4-D Amine with 4 pounds of acid equivalent per gallon and Tordon 101-R have been used successfully on the Y-LT. The chemical is metered through the injector at the rate of 1 milliliter per incision. Set the injector meter to release this amount with one opening of the valve, and check the setting periodically to ensure correct dosage. Other chemicals in granular form may also be used.

Incisions. — Crew members must be trained before they attempt to incise trees. Incisions must be:

—as close to ground level as possible
—on a level plane around the tree
—positioned to prevent spillage
—deep enough to penetrate the cambium layer

Space incisions 2 inches apart, from edge to edge, except for hard-to-kill species. Gums, maples, cedars, and hickories require edge to edge incisions so the tree is completely frill-girdled. As in all field work, safe work habits must be practiced.

INSPECTIONS

Who and When

The project forester, forestry technician, crew foreman, and PMO timber management specialist will periodically inspect each HSI crew to evaluate the quality of the work, and to identify specific errors in order to take corrective action.

Inspection frequency:

Crew foremen — Daily
Forestry technician — Twice weekly
Project forester — Weekly
PMO Timber management specialist — Monthly

Crew foreman. — Using Form FP-30, the foreman will check crew performance by recording information on four 1/100-acre plots each day. In addition to inspecting for correct incisions as described above, the foreman will check the following:

- seedling adequately released
- unnecessary work
- average d.b.h. of stems treated
- key wildlife areas identified and retained
- retention of den trees
- retention of preferred wildlife habitat trees
- retention of hardwood hollows and stringers

Daily expenditures are also entered on Form FP-30. These forms are filed in a binder and retained for 3 years, and then discarded.

Forestry technician. — Using Form FP-26, the technician will select five 1/100-acre plots and check the same items as prescribed for the crew foreman. In addition, the technician will verify that crew organization is the same as described in the planting guidelines. Safety will be a documented part of each inspection. The technician must be thoroughly familiar with the hazards of HSI work including chemical hazards, and know the requirements of the Unit Safety Plan. The technician will discuss inspection results with the crew foreman and help with needed corrective action. The FP-26 will be filed in the unit office and retained for 3 years.

Project Forester. — Conducts the same inspection as the technician; some of the project forester's checks should be made jointly with the technician. Both should sign the FP-26 on joint inspections.

PMO Timber Management Specialist. — The TMS will conduct the same inspection as the forester and technician; they should accompany the TMS on each inspection. In addition to checking immediately behind the crew, the TMS will check on work done at least 1 week before. On each inspection, ten 1/100-acre plots, spaced at least 1 chain apart, will be checked.

TRAINING

Minimum training must include:

Pre-work Training Sessions. — Covers fundamentals of HSI, including crew organization before starting HSI. Training sessions may be held twice a year on some units.

Training of New Crew Members. — Two hours of training will be given to every new employee before placing him or her in line with a tree injector. This training will include demonstration and supervised practice. Safety hazards and their recognition will be emphasized.

CHAPTER 5.
WILDLIFE COORDINATION

GENERAL REQUIREMENTS

Food and cover determine habitat quality. There must be cover suitable for the behavioral and physiological requirements of a particular species, and a favorable combination of food and cover within its normal range.

The project forester must keep in mind that much can be done to enhance wildlife habitat in the even-aged management of loblolly pine plantations. The average plantation is small, about 20 acres, and can often provide cover not available in areas managed as cropland, pasture and other uses.

Because forest habitat is constantly changing, the nature and timing of silvicultural treatments is critical. A decision to favor or discriminate against a tree or other vegetation during the first treatment will alter stand composition through the rotation, thereby affecting wildlife food and cover.

On the Y-LT, tree planting and HSI are usually the first treatments that will permanently affect wildlife throughout the rotation. Therefore, the objectives of the landowner concerning wildlife must be identified before this work is started.

The farm planner and forestry technician who determine planting area boundaries share the responsibility for meeting the landowner's objectives; they should canvass the area to identify habitat suitable for protection. These habitats should be shown on the planting map or otherwise noted for the crew foreman. However, it isn't practical at this point to locate den trees or small key areas. Planting and HSI crew foreman must identify and protect these trees as they work through the area.

KEY AREAS

This land is managed primarily for wildlife food, water, and cover. The key areas supplement nearby forests managed for timber and erosion control. Key areas can be stand size or smaller and can be managed through various silvicultural techniques. These areas should be identified and protected before initial planting or HSI. Examples of key areas are:

—Hardwood hollows. In addition to hard mast-producing species, they usually contain clumps of ash, elm and maple which provide spring food and den trees for squirrels.
—Abandoned house sites.
—Wild plum thickets.
—Branch and spring heads.
—Sumac patches.
—Fringes of ponds and gully tangles.
—Wild grape and muscadine slopes and tangles.
—Blackberry patches.
—Winter huckleberry.
—Thornapple clumps.
—Chinkapin clumps.
—Green briar thickets.
—Mineral licks.
—Honeysuckle patches.
—Hawk, eagle, or owl nests.
—Old logging roads.

DEN TREES

Den trees are usually 14 inches d.b.h. or larger in upland types with a rainproof, weathertight cavity. Squirrel holes are about 2½ to 3 inches in diameter, 18 inches deep, about 30 feet above the ground. Den trees should be identified and left undisturbed.

PROTECTED TREE SPECIES

The following species should be protected when performing HSI:

Black cherry	Redbud
Apple	Dogwood
Holly	Black walnut
Mulberry	Yellow-poplar

Unit personnel will familiarize themselves with Forest Service Handbook 2609.23R, *Wildlife Habitat Management Handbook.*

TRAINING

The project foresters will train all technicians and foremen in the recognition and protection of key areas to enhance wildlife habitat. This training will be covered on all periodic inspections.

APPENDIX

REPORTS, RECORDS AND FORMS FOR PLANNING OPERATIONS

Reports

Weekly Planting Report, Form Y-LT-6.— This report provides information required in the Quarterly Accomplishment and Annual Planting Reports. It provides controls for seedling inventories, program accomplishment, and field planting costs. The planting week begins on Friday and ends on Thursday. This report will be completed and mailed *in time for arrival at the PMO on Monday morning.* A copy will be kept at the unit office. Negative reports are required.

The forestry technician will complete the report and review it with the project forester before mailing. The project forester or a designated representative will initial it. Submit the entire report; do not detach unused sections.

Y-LT Weekly Planting Report, Form Y-LT-10. — This report summarizes the information on individual Y-LT-6's and is completed by the TMS. The TMS mails a copy to field units each Monday.

Annual Planting Report. — This report will be completed by the project forester upon completion of the planting season. Don't procrastinate; other agencies need this information quickly. Because of the distribution of this information and its importance, great care must be taken to ensure accuracy and brevity. Photographs of unusual situations which are difficult to describe may be included, but merely illustrating the report is discouraged. All figures appearing in this report must agree with those on Forms FP-52. Figures shown on FP-52's must agree with those reported on Forms FP-1300-5 and Y-LT-6.

Records.

Daily Inventory Sheet. — The form originally designed for this purpose has been discontinued on the Y-LT. However, it is necessary to keep a running record, always available for inspection, which shows the areas planned for planting, and the daily planting accomplished, both original planting and replanting. Each sheet should cover an entire planting season and be accurate enough to enable the field location to be found easily. Give enough detail to use in formulating management plans and 15-year survival checks.

Farm Plan Folder. — This record will include an up-to-date overlay showing areas planted, seedling receipts, and a copy of the SCS plan for the farm.

Aerial Photo Atlas. — Planted areas will be drawn in and dated on the 8-inch per mile (1:7920) aerial photos using the following legend:

GC and CAS — Solid red
Replant - Diagonal red lines
Other (Non-assistance trees only, etc.) -Solid green

This posting should be done when the overlay is placed in the farm plan folder.

Planimetric County Wall Map. — Post and date planted areas on this map when the aerial photo atlas is posted.

Miscellaneous Forms

Tree Delivery Schedule (Y-LT-9). — This form is initiated in the PMO to authorize seedling shipments. Send copies to the trucker, nursery, and field units.

Nursery Report (Y-LT-1). — Immediately after receipt and inspection of seedling shipments, this form must be completed and mailed to the PMO.

Tree Checkout List (Y-LT-8). — Use this form at the seedling storage area to record seedling issuance.

Seedling Receipt (Y-LT-7). — This form documents seedlings issued to cooperators who must sign it. It is filed in the farm plan folder.

Planting Check - Crew Foreman Inspection (Y-LT-2). — The planting crew foreman uses this form when checking a crew member for planting quality. It includes some other items to be inspected. (See Planting Quality check section.)

Unit Planting Crew Inspection (Y-LT-3). — The project forester, forestry technician, and PMO timber management specialist use this form to check crew performance. (See Planting Quality Check section.)

Force Account Crew Cost Record (Y-LT-4) — The crew foreman used this form to record daily costs and accomplishments. The forestry technician used it to make the Weekly Planting Report.

REPORTS AND RECORDS FOR HYDROLOGIC STAND IMPROVEMENT

Reporting and recordkeeping should be coordinated to provide information on progressive stages of work.

Reports

Weekly HSI Report, Form FP-37-A). — Information on this report will be taken from Form FP-30, and will be submitted to the PMO timber management specialist on the same schedule as the Weekly Planting Report. After the first report, one must be submitted each week, including negative reports, until the HSI is terminated for the season. Information for the quarterly report (Form FP-1300-5) will be taken from FP-37-A. Data on the last full weekly report in each quarter must agree with that posted on the quarterly report.

Y-LT Weekly HSI Report, Form FP-37. — This summary is abstracted from Form FP-37-A. The timber management specialist will complete this report on Mondays and mail it to field units.

Records

Daily Inventory Sheet. — These data must be kept current. Refer to Records section under Tree Planting.

Farm Plan Folder. — Make an overlay of HSI areas and place it in the Farm Plan Folder.

Aerial Photo Atlas. — HSI will be posted and dated on the 8 inch per mile aerial photos using the following legend:

GC and CAS Force Account - Solid brown

This should be posted as the HSI is done.

HSI Planimetric Wall Map. — This map is separate from the planting map. Post HSI on this map at same time as posting aerial photo atlas.

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PESTICIDE PRECAUTIONARY STATEMENT

Pesticides used improperly can be injurious to man, animals, and plants. Follow the directions and heed all precautions on the labels.

Store pesticides in original containers under lock and key — out of the reach of children and animals — and away from food and feed.

Apply pesticides so that they do not endanger humans, livestock, crops, beneficial insects, fish, and wildlife. Do not apply pesticides when there is danger of drift, when honey bees or other pollinating insects are visiting plants, or in ways that may contaminate water or leave illegal residues.

Avoid prolonged inhalation of pesticide sprays or dusts; wear protective clothing and equipment if specified on the container.

If your hands become contaminated with a pesticide, do not eat or drink until you have washed. In case a pesticide is swallowed or gets in the eyes, follow the first-aid treatment given on the label, and get prompt medical attention. If a pesticide is spilled on your skin or clothing, remove clothing immediately and wash skin thoroughly.

Do not clean spray equipment or dump excess spray material near ponds, streams, or wells. Because it is difficult to remove all traces of herbicides from equipment, do not use the same equipment for insecticides or fungicides that you use for herbicides.

Dispose of empty pesticide containers promptly. Have them buried in a sanitary land-fill dump, or crush and bury them in a level, isolated place.

Some States have restrictions on the use of certain pesticides. Check your State and local regulations. Also, because registrations of pesticides are under constant review by the U.S. Environmental Protection Agency, consult your county agricultural agent or State extension specialist to be sure intended use is still registered.

For additional information contact your
State forestry agency
or
USDA Forest Service, Southeastern Area
1720 Peachtree Road, N.W.
Atlanta, Georgia 30367